Comandra and Stalactiform Blister Rusts

Branch and stem rusts of lodgepole and ponderosa pines

Pathogen—The rust fungi *Cronartium comandrae* and C. *coleosporioides* cause comandra and stalactiform blister rusts, respectively.

Hosts—Lodgepole and ponderosa pine are hosts of both rusts, but stalactiform is uncommon on ponderosa pine. The alternate hosts also differ (figs. 1-2). The alternate hosts for comandra blister rust are bastard toadflax (*Comandra umbellata*) and northern comandra (*C. livida*). The alternate hosts for stalactiform rust include several broadleaved plants but mainly species of Indian paintbrush (*Castilleja* spp.). Comandra rust is especially severe in Wyoming and areas of northern Colorado. Stalactiform rust is less common in the Region.

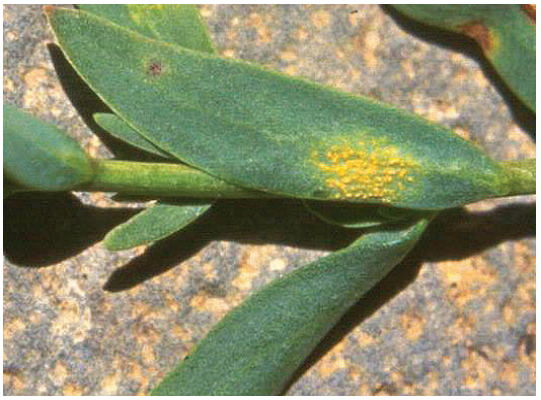

Figure 1. The alternate host for comandra blister rust is bastard toadflax. *Photo: William Jacobi, Colorado State University, Bugwood.org.*

Figure 2. Principal alternate hosts for stalactiform blister rust are species of Indian paintbrush. *Photo: Andrew Kratz, USDA Forest Service.*

Signs and Symptoms—Symptoms on pines include branch flagging, rough branch cankers, elongate stem cankers, top-kill (spike tops), and tree mortality (figs. 3-4). Rodents may feed on branch and stem canker margins, and damage is often accompanied with heavy resin flow. Top-kill is much more common with comandra rust.

Stem cankers initially have rough bark and heavy resin flow. With time, stem cankers slough the dead bark, revealing perennial stem cankers with concentric ridges of resinous sapwood and dead cambium that result from the annual canker growth. Stem cankers caused by the rusts are similar in appearance, but comandra rust cankers tend to be one and one-half to four times longer than wide, while stalactiform rust cankers tend to be eight to many times longer than wide.

For pines, the signs include light yellow to orange pustules (aecia) of spores (aeciospores) produced at canker margins in late spring and early summer (figs. 5-6). Cankers caused by comandra blister rust tend to be yellow-colored and cause top-kill after girdling the stem. The fungi are best differentiated by microscopic examination of spores.

Symptoms on the alternate hosts can include tan to brown leaf spots. However, the signs may be present with few symptoms. Signs, visible on the underside of leaves, include orange-colored fruiting bodies (uredinia) with spores (urediniospores), and later in the year, rust-brown, hair-like structures (telia) form.

Disease Cycle—Both rusts require two different hosts to complete their life cycle. The incidences of these diseases are correlated with presence of their alternate hosts. Studies have shown a high incidence of comandra blister rust in pine stands near sagebrush. Bastard toadflax is an obligate parasite of sagebrush and many other woody perennial plants.

Both rusts have five spore stages. Three spore stages (uredinia, telia, and basidia) develop on the alternate hosts, and two spore stages (spermogonia and aecia) develop on the pines.

Basidiospores are wind-blown from the alternate hosts and infect pine needles and new shoots. The basidiospores cannot infect the alternate hosts. Fungal hyphae grow through the phloem and cambium of branches, forming

Figure 3. Comandra blister rust canker on an older stem. *Photo: James T. Blodgett, USDA Forest Service.*

Figure 4. Stalactiform blister rust canker on an older stem. *Photo: John Guyon, USDA Forest Service, Bugwood.org.*

Figure 5. Comandra blister rust sporulating on a young stem. *Photo: James T. Blodgett, USDA Forest Service.*

Figure 6. Stalactiform blister rust sporulating on a young stem. *Photo: USDA Forest Service Archive, Bugwood.org.*

perennial cankers that can spread to the stem. Spermogonia develop within the canker in the spring and early summer and aecia are produced in the same tissue the following spring and early summer. The aeciospores are wind-disseminated. These spores can only infect the alternate host's leaves. The urediniospores produced on the underside of leaves re-infect the alternate host leaves during the summer but cannot infect pines. Basidiospores develop on the telia in late summer or fall for comandra rust or late spring for stalactiform rust and infect the pines. Long periods of high humidity are required for infection of the pine hosts. Therefore, rust epidemics often involve a burst of infections during a year with a long, moist season.

Impact—Comandra rust is one of the more important diseases of lodgepole pine in the region. Both rusts can cause stem deformities, growth reduction, and cankers that girdle branches or stems, resulting in top-kill or tree mortality. Stem girdling and top-kill are far more frequent with comandra rust. Trees may survive several decades with spiked tops, and at times, a lower branch will assume terminal dominance and produce a new top. However,

the cankers can continue to grow down the stem, killing the new top. Infection is occasionally heavy, causing high volume losses in stands.

These rusts affect the form, lumber quality, and growth rate of trees. Although these fungi can kill individual trees, they do not kill whole stands. On large trees, stem cankers often result in non-merchantability of infected logs. Infected seedlings and young trees are frequently killed. Because fruiting bodies are sparse on old stem cankers and rodents (especially porcupines and squirrels) chew canker margins, the damage is often attributed entirely to other causes.

Management—Removing infected trees during partial cuts, using disease-free trees as leave trees during seed cuts, pruning infected branches, and planting non-host species are ways to reduce losses.

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